Quantum computing of delocalization in smallworld networks

The program smallworld.C aims at simulating the evolution of a wavepacket under the "smallworld" hamiltonian H of [1]. The wavepacket is initially localized on one vertex (instruction C. SetZero()). It evolves under the action of

$$\exp(iHdt) = e^{i(H_0+H_1+H_2)dt} = e^{iH_0\frac{dt}{2}}e^{iH_1\frac{dt}{2}}e^{iH_2dt}e^{iH_1\frac{dt}{2}}e^{iH_0\frac{dt}{2}} + O(\Delta dt^3)$$

. The evolution operator is sliced into repet=t/dt slices. At each time step $\exp(iHdt)$ is applied and the participation ratio of the wavefunction C is calculated.

The output file yields the plot IPR as a function of time (fig. 2 and 3 of [1], green curves). Parameters are:

- the number of qubits N_q;
- the disorder strength W and the coupling strength between neighbours V;
- the number *boumax* of disorder realizations
- the max time t;
- the time step dt;
- the smallworld link rate p.

[1] *Quantum computing of delocalization in smallworld networks*, O. Giraud, B. Georgeot and D. Shepelyansky, Phys. Rev. E **72**, 036203 (2005)